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defined, the plurality of amplitude values including an amplitude Fa(high) of the first frequency spectrum at the defined high frequency, an amplitude Fa(low) of the first frequency spectrum at the defined low frequency, an amplitude of the second frequency spectrum Fb(high) at the defined high frequency, and an amplitude Fb(low) of the second frequency spectrum at the defined low frequency;

- e. a fifth means for defining a t^* attribute from the plurality of amplitude values by subtracting the natural log of the ratio of Fa(low) to Fb(low) from the natural log of the ratio of Fa(high) to Fb(high) to get a numerator and dividing the numerator by a denominator which is the defined high frequency less the defined low frequency; and
- f. a sixth means for plotting the t^* attribute on a map and assigning a unique color to the t^* attribute.

Please cancel claims 2, 3, 4, 6, 7, 8, 10, 11, and 12 without prejudice and without disclaimer of the subject matter therein.

REMARKS

There has not yet been an Office Action. Claims 1 through 12 are pending in the application. Claims 1, 5 and 9 have been amended in this Response. Claims 2, 3, 4, 6, 7, 8, 10, 11, 12 have been cancelled. No claims have been added. No new matter has been added. For the Examiner's convenience, the amended claims are set forth in a version marking the changes in an Exhibit A to this Preliminary Amendment. Applicant respectfully requests consideration of the pending claims in light of these amendments and the following remarks.

I. Support for the Amendments

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Support for the amendment of claim 1 can be found at claim 1 as filed, Figs 3-7 and in the instant Specification as filed at page 6, line 20 through page 7, line 29. Support for the amendment of claim 5 can be found at claim 5 as filed, Figs 3-7 and in the instant Specification as filed at page 6, line 20 through page 7, line 29. Support for the amendment of claim 9 can be found at claim 9 as filed, Figs 3-7 and in the instant Specification as filed at page 6, line 20 through page 7, line 29

CONCLUSION

Applicant respectfully requests consideration of this application and early allowance of its pending claims.

Respectfully submitted,



Danita J. M. Maseles

Reg. 33,419

Date: March 14, 2003

Enclosures:

1. Transmittal Form
2. Power of Attorney
3. Fee Transmittal and Authorization to Charge Deposit of Account (in duplicate).



EXHIBIT A
MARKED VERSION OF AMENDED CLAIMS

- 1) (Amended) A method of detecting fractures in a fractured zone in an Earth formation, comprising the steps of:
- a) propagating a plurality of acoustic waves [propagating] through the fractured zone [so that] so that the plurality of acoustic waves reflect[ing] off a horizon in the formation;
 - b) receiving and recording [and, responsive thereto,] a plurality of seismic traces responsive to and representative of [said] the acoustic waves propagating through [said] the fractured zone [being received and recorded,] wherein a first portion of [said] the seismic traces corresponds[ing] to a first window located above [said] the fractured zone in [said] the formation, and a second portion of [said] the seismic traces corresponds[ing] to a second window located below [said] the fractured zone in [said] the formation, [said method comprising the steps of:];
 - c) generating a first frequency spectrum associated with [said] the first portion of [said] the seismic traces corresponding to [said] the first window;
 - d) generating a second frequency spectrum associated with [said] the second portion of [said] the seismic traces corresponding to [said] the second window;
 - e) superimposing [said] the first frequency spectrum onto [said] the second frequency spectrum thereby generating a superimposed frequency spectrum and defining from the superimposed frequency spectrum a low frequency [low] and a high frequency [high];
 - f) when [said] the low frequency and [said] the high frequency is defined, further defining from the superimposed frequency spectrum a plurality of amplitude values, [said] the plurality of amplitude values including: an amplitude Fa(high) of the first frequency spectrum at the defined high frequency, an amplitude Fa(low) of the first frequency

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spectrum at the defined low frequency, an amplitude of the second frequency spectrum Fb(high) at the defined high frequency, and an amplitude Fb(low) of the second frequency spectrum at the defined low frequency;

- g) from [said] the plurality of amplitude values, defining a t* attribute by subtracting the natural log of the ratio of Fa(low) to Fb(low) from the natural log of the ratio of Fa(high) to Fb(high) to get a numerator and dividing the numerator by a denominator which comprises the defined high frequency less the defined low frequency;
- h) plotting the t* attribute value on a map and assigning a unique color to [said] the t* attribute[value].
5. (Amended) A program storage device readable by a machine, tangibly embodying a program of instructions executable by the machine to perform method steps for detecting fractures in a fractured zone in an Earth formation, the method steps comprising:
- a. [a plurality of acoustic waves propagating through the fractured zone and reflecting off a horizon in the formation and, responsive thereto, operating on a plurality of received and recorded seismic traces, responsive to and representative of [said acoustic waves propagating through said fractured zone] a plurality of acoustic waves propagating through the fractured zone and reflecting off a horizon in the formation, [being received and recorded,] to define a first portion of [said] the seismic traces corresponding to a first window located above [said] the fractured zone in [said] the formation, and to define a second portion of [said] the seismic traces corresponding to a second window located below [said] the fractured zone in [said] the formation[, said the method steps comprising]:
- b. generating a first frequency spectrum associated with [said] the first portion of [said] the seismic traces corresponding to [said] the first window;

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- c. generating a second frequency spectrum associated with [said] the second portion of [said] the seismic traces corresponding to [said] the second window;
 - d. superimposing [said] the first frequency spectrum onto [said] the second frequency spectrum thereby generating a superimposed frequency spectrum and defining from the superimposed frequency spectrum a low frequency [(low)] and a high frequency [(high)];
 - e. when [said] the low frequency and [said] the high frequency[is] are defined, further defining from the superimposed frequency spectrum a plurality of amplitude values, including an amplitude Fa(high) of the first frequency spectrum at the defined high frequency, an amplitude Fa(low) of the first frequency spectrum at the defined low frequency, an amplitude of the second frequency spectrum Fb(high) at the defined high frequency, and an amplitude Fb(low) of the second frequency spectrum at the defined low frequency;
 - f. from [said] the plurality of amplitude values, defining a t^* attribute by subtracting the natural log of the ratio of Fa(low) to Fb(low) from the natural log of the ratio of Fa(high) to Fb(high) to get a numerator and dividing the numerator by a denominator which comprises the defined high frequency less the defined low frequency; and
 - g. plotting the t^* attribute [value] on a map and assigning a unique color to the [said] t^* attribute [value].
9. (Amended) An apparatus adapted for detecting fractures in a fractured zone in an Earth formation, [a plurality of acoustic waves propagating through the fractured zone and reflecting off a horizon in the formation and, responsive thereto, a plurality of seismic traces representative of said acoustic waves propagating through said fractured zone being received and recorded, a first portion of said seismic traces corresponding to a first window located above said fractured zone in said formation, and a second portion of said

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seismic traces corresponding to a second window located below said fractured zone in said formation, said] the apparatus comprising:

- a) a first means for operating on a plurality of received and recorded seismic traces, responsive to and representative of a plurality of acoustic waves propagating through the fractured zone and reflecting off a horizon in the formation, to define a first portion of the seismic traces corresponding to a first window located above [said] the fractured zone in the formation,
- b) a second means to define a second portion of the seismic traces corresponding to a second window located below the fractured zone in [said] the formation to generate[ing] a first frequency spectrum associated with [said] the first portion of [said] the seismic traces corresponding to [said] the first window and to generate [second means for generating] a second frequency spectrum associated with [said] the second portion of [said] the seismic traces corresponding to [said] the second window;
- c) a third means for superimposing [said] the first frequency spectrum onto [said] the second frequency spectrum thereby generating a superimposed frequency spectrum and defining from the superimposed frequency spectrum a low frequency [(low)] and a high frequency [(high)];
- d) a fourth means for further defining, from the superimposed frequency spectrum, a plurality of amplitude values when [said] the low frequency and [said] the high frequency is defined, [said] the plurality of amplitude values including an amplitude $F_a(\text{high})$ of the first frequency spectrum at the defined high frequency, an amplitude $F_a(\text{low})$ of the first frequency spectrum at the defined low frequency, an amplitude of the second frequency spectrum $F_b(\text{high})$ at the defined high frequency, and an amplitude $F_b(\text{low})$ of the second frequency spectrum at the defined low frequency;

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- e) a fifth means for defining a t^* attribute from [said] the plurality of amplitude values by subtracting the natural log of the ratio of $F_a(\text{low})$ to $F_b(\text{low})$ from the natural log of the ratio of $F_a(\text{high})$ to $F_b(\text{high})$ to get a numerator and dividing the numerator by a denominator which is the defined high frequency less the defined low frequency; and
- f) a sixth means for plotting the t^* attribute [value] on a map and assigning a unique color to [said] the t^* attribute[value].

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